



Cost-Benefit Analysis of Ohio's Recreational Cannabis Legalization

October 2023

Executive Summary

In November 2023, Ohioans will decide whether or not they want to legalize the recreational use of cannabis in the State. If the measure passes, they would become the 24th state to create a legal market for the sale of cannabis for recreational use.

Allowing a market for sale of cannabis for recreational use will impact the state economy. Opening the market will allow people access to goods they would not have had otherwise, generate tax revenue for state programs, create new jobs, and reduce crime by reducing the importance of a black market in cannabis sales. At the same time, other states that have legalized recreational cannabis have seen reduced worker productivity and increased prevalence of impaired driving.

Taking all these factors into account, we estimate the legalization of the sale and purchase of cannabis for recreational use to have a net present value to the state economy of about \$260 million per year, mostly driven by productive use of tax revenue for job training and addiction recovery programs. Our simulation model suggests a wide range of possible alternatives, though, with 90% of likely scenarios showing the net present value ranging from a net loss of \$150 million to a net gain of \$1.9 billion. In 90% of simulations, the net present value of legalization of the market was positive.

Problem definition

In 2016, Ohio passed House Bill 523, a law legalizing medical marijuana use. In doing so, it joined the majority of states in allowing either medical or recreational cannabis use. As attitudes about marijuana use change, more states are moving to full legalization of marijuana use for recreational purposes.

Despite the sale of marijuana for recreational use being illegal in Ohio, there is still a market for people who want to use marijuana recreationally. Because of the criminality of the activity, though, these people tend to operate in the black market.

Black markets are rife with inefficiencies that regulations can ameliorate. For example, buyers and sellers take on risk when they participate in a black market. These risks include fines and imprisonment by law enforcement and crime victimization

due to lack of market oversight by the government. These risks operate like a tax does, driving up prices for consumers and creating economic losses for consumers and producers.

Additionally, consumers don't have the same protections that would be afforded them in a well-regulated market. In unregulated black markets, there is little to no quality and safety insurance for consumers, and there isn't any legal recourse if suppliers don't operate fairly.

Also of concern is the fact that law enforcement agencies need to use their resources to try and prevent black market activity. As attitudes about recreational cannabis use shift, it becomes less important to prevent this activity, and those law enforcement resources could be used more effectively elsewhere.

On the other hand, marijuana use has been found to have health impacts that lead to public problems like losses to productivity and impaired driving. In theory, the tax levied on marijuana use and production by disallowing the market could internalize the costs of these public health measures and make the market more efficient as a whole.

Issue Two

In August 2023, Issue Two was certified by the Ohio Secretary of State, giving Ohioans the chance to directly vote on whether or not recreational cannabis will become legal.¹ The proposal lays out the framework for how recreational cannabis will be regulated, taxed, and what the tax revenue will be used for.

The proposal will do the following:

- Legalize the cultivation, processing, sale, purchase, possession, home growth, and use of cannabis by adults at least 21 years old.
- Establish the Division of Cannabis Control, which will have the authority to regulate, investigate, and penalize cannabis operators.

1. Ohio Secretary of State, "To Commercialize, Regulate, Legalize, and Tax the Adult Use of Cannabis Proposed Law," 2023, <https://www.ohiosos.gov/globalassets/ballotboard/2023/issue-2-certified-language--08-24-23.pdf>.

- Authorize a 10% excise tax on the value of sales of cannabis in addition to normal sales tax.
- Establish the Cannabis Social Equity and Jobs program.
- Create a program for cannabis addiction services in partnership with the Department of Mental Health and Addiction Services

Impacts

Consumer Surplus

Consumer surplus is a quantified measure of how much value consumers in a market receive from their activity in that market. Specifically, it is the difference in how much people are willing to pay for a product and the market price for that product. For example, if someone was willing to pay \$50 for a good that only cost \$10 in the market, then they would get \$40 of consumer surplus. Consumer surplus is a benefit because as it increases, it means that the economy is allowing people to maximize the use of their limited resources.

Our model for consumer surplus is built on research on the cannabis market in the state of Washington. We extrapolate research that has been previously done on consumer surplus in Washington and estimate how much consumers in Ohio stand to benefit from legalization of the market.²

The main difference between Ohio's proposal and Washington's actual cannabis market is that Ohio is proposing a tax rate of 10% while Washington has a higher tax rate of 37%. By lowering the effective tax rate in Ohio through legalization, we lower the price consumers have to pay and increase the quantity of cannabis consumed in the market.

This report gives us an estimate for the price elasticity of demand for recreational marijuana sales. This enables us to calculate the tax-free price of recreational cannabis and allows us to estimate the price under the Ohio tax regime.³

2. Danna Thomas, "License quotas and the inefficient regulation of sin goods: Evidence from the Washington recreational marijuana market," *Available at SSRN 3312960*, 2019,

3. *Ibid.*

Similarly, the same paper reports how much the quantity of recreational cannabis consumed fell when Washington increased their tax rate. Assuming the decrease in quantity demanded is proportional to the change in tax, we use the results found in Washington to estimate how legalization will increase the quantity demanded in Ohio. Finally, we make adjustments for differences in population⁴ and prices between Washington and Ohio.⁵

After adjusting for the new tax rate, the differences in population, and the differences in regional prices, we estimate that **the total benefit consumers of cannabis will receive in Ohio will total about \$98 million**. Because a black market for recreational cannabis exists already, this figure is likely an upper bound on the amount of value consumers will receive through legalization.

Tax Revenue

An additional result we estimate using our consumer surplus model is the tax revenue we expect the state to collect from the sale of recreational marijuana. We estimate this using the tax rate specified in the language of the ballot initiative and the estimated quantity and price of recreational marijuana sold from our market analysis.

Tax revenue on its own is not a social benefit, but rather a transfer from taxpayers to the public sector that is then used to pay for goods and services purchased by the government. Thus, benefits are only generated when goods and services purchased by governments have positive spillovers. Using the text of the proposed legislation, we can see how funds are to be spent:

- 36% - Cannabis Social Equity and Jobs Fund
- 36% - Host Community Cannabis Facilities Fund
- 25% - Substance Abuse Addiction Fund
- 3% - Division of Cannabis Control and Tax Commission Fund

4. U.S. Census Bureau. (2021). 2017-2021 American Community Survey 5-year Public Use Microdata Samples. Retrieved from <https://data.census.gov/table?q=ohio+age>

5. Bureau of Economic Analysis, "Regional Price Parities by State and Metro Area," 2022, <https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>.

Using this guidance, we make estimates of how much social value will be generated by this new tax revenue. To do this, we reference the Washington State Institute of Public Policy’s database of cost-benefit analyses and identify programs similar to those specified above.⁶ Analysts at the Washington State Institute for Public Policy estimated a benefit-cost ratio for each of these programs which we use as the basis for our estimates of the social value of each tax dollar raised in Ohio.

Of the listed uses for tax dollars, we calculate benefits for the Cannabis Social Equity and Jobs Fund and the Substance Addiction Fund. The Host Community Cannabis Facilities Fund and the Division of Cannabis Control and Tax Commission Fund are administrative funds that operate as transfers from taxpayers to administrator salaries, which we should expect to have a net value to society of zero. From Washington State, we estimate that the average benefit-cost ratio for programs similar to the Cannabis Social Equity and Jobs Fund is \$5.76 in benefits for every dollar spent. We estimate the average benefit-cost ratio for programs similar to the Substance Abuse Addiction Fund is \$9.19 in benefits for every dollar spent.

Our model estimates that Ohio will collect just over \$190 million of tax revenue from the recreational cannabis market. This means that \$67 million for **the Cannabis Social Equity and Jobs Fund would generate \$390 of benefits**, and the \$46 million that goes to **the Substance Abuse Addiction Fund would generate \$430 million of benefits**.

Recently, the Ohio State University Drug Enforcement and Policy Center reported estimates for the tax revenue recreational cannabis legalization could raise.⁷ They found that in year two of operations, tax revenue would be between \$182 and \$218 million, very close to our own estimate.

Jobs

One clear benefit of legalizing sale and purchase of recreational cannabis is that the new market will create new jobs for producers and retailers in the industry. To estimate the number of jobs created in Ohio, we use data reported by cannabis

6. Washington State Institute for Public Policy, “Benefit-Cost Results,” 2023, <https://www.wsipp.wa.gov/BenefitCost>.

7. Jana Hrdinova and Dexter Ridgway, “What Tax Revenues Should Ohioans Expect If Ohio Legalizes Adult-Use Cannabis?(2023 Report),” *Ohio State Legal Studies Research Paper*, no. 791 (2023).

market research company Leafly about the size of the recreational cannabis industries in other states.⁸ To estimate the growth of the industry in Ohio, we make adjustments to trends seen in other states based on the relative size of the state labor force as reported by the Bureau of Labor Statistics.⁹

In most states, the recreational cannabis industry takes a few years to mature. Producers need time to do things like build inventory, find storefront locations, and receive licenses. Because of pattern, we expect job growth in the first year to be fairly small.

Our models predict that Ohio will add roughly 3,300 new jobs in the first year after legalization. Assuming these jobs are full time and pay matches the average wage across the state of Ohio, this will amount to **about \$190 million in wage benefits for workers across the state.**¹⁰ Since these jobs are likely to include part-time work and may be lower than the average wage across the state, this may represent an upper bound on the value of employment generated by legalization.

Crime

Another significant benefit of legalizing the sale and purchase of recreational cannabis is the impact it will have on the criminal justice system. Fewer people will be arrested if it is no longer a crime to use cannabis recreationally.

This is a benefit to society because arrests are costly for both law enforcement and the people being arrested. Based on data from the ACLU, we estimate each marijuana-related arrest costs law enforcement roughly \$4,400.¹¹

The costs are even greater for the individuals who are arrested. One report from 2009 found that on average, individuals subject to marijuana-related prosecution incurred \$10,900 of costs in the form of attorney fees, other legal fees, and lost wages.¹²

8. Beau Whitney Bruce Scott, “The US cannabis industry now supports 428,059 jobs,” 2022, <https://www.leafly.com/news/industry/cannabis-jobs-report>.

9. Bureau of Labor Statistics, “Economy at a Glance,” 2023, <https://www.bls.gov/eag/eag.oh.htm>.

10. Bureau of Labor Statistics, “Occupational Employment and Wage Statistics,” 2023, https://www.bls.gov/oes/current/oes_oh.htm.

11. ACLU, “The War on Marijuana in Black and White,” 2013, <https://www.aclu.org/files/assets/1114413-mj-report-rfs-rell.pdf#77>.

12. Katherine Beckett and Steve Herbert, “The consequences and costs of marijuana prohibition,”

Additionally, 6% of people arrested for marijuana crimes end up with felony convictions and have to serve at least six months prison time.^{13,14} Prisons are costly to operate and have negative impacts on people who are convicted. According to the Health Policy Institute of Ohio, it costs about \$30,600 per year to incarcerate one person in a state prison.¹⁵

One study on arrest rates in Washington found that marijuana arrests fell by 87% for adults age 21+ and by 46% for adults age 18-21 after legalization of the sale and purchase of cannabis for recreational purposes. This confirms that for the population that would be allowed to legally use cannabis recreationally, arrests almost completely disappear, but the effect is smaller for the population where it would still be illegal to use cannabis.

Using data from the FBI's Uniform Crime Report on the number of cannabis-related arrests in Ohio, we estimate that there would be about 4,400 fewer arrests per year if recreational cannabis were legalized. Adding up the cost of those arrests, and assuming that 6% of those people would have been convicted of felonies, this amounts to **over \$38 million in savings for Ohio.**

Productivity

One major cost associated with legalizing recreational cannabis is the impact it has on worker productivity. If legalizing recreational cannabis will lead to increased consumption of cannabis, then it will also lead to lower levels of worker productivity.

One study from 2017 found that across four industries (mining; construction; arts, entertainment, and recreation; and accommodations and food Service) average productivity per worker fell by just over 1% in states that legalized recreational

Substance Abuse and Mental Health Services Administration. (2009). Results from the, 2008,

13. Kelly McLaughlin Walt Hickey, "Despite legalizing simple possession, marijuana arrests still inflict tens of billions of dollars in economic damage on Americans annually," 2019, <https://www.insider.com/marijuana-arrests-are-costing-the-us-billions-2019-6#:~:text=While%20the%20ACLU%20reported,billions%20of%20dollars%20every%20year..>

14. Ohio Criminal Sentencing Commission, "DRUG OFFENSE QUICK REFERENCE GUIDE," 2018, <https://www.supremecourt.ohio.gov/Boards/Sentencing/resources/judPractitioner/drugQuickRef.pdf>.

15. Health Policy Institute of Ohio, "Facts Figures: Criminal Justice and Health," 2021, <https://www.healthpolicyohio.org/facts-figures-criminal-justice-and-health/#:~:text=Incarceration%20is%20costly%20for%20Ohio,state%20prison%20incarceration%20this%20year..>

cannabis.¹⁶ Monetized, this equates to roughly \$900 of lost productivity per worker for Ohio.

In practice, it is unlikely that legalizing recreational cannabis use will cause every worker in these industries to become 1% less productive. It is much more likely that a small number of workers become significantly less productive as a result of easier access to cannabis.

In the long run, the labor market may correct for this inefficiency and productivity impacts that come from it. Employers will screen for cannabis use and pass up on employees who have productivity impacts for more productive workers. However, due to frictions in the labor market such as the costs associated with firing and training new employees, this will likely impact key industries in the short- and medium-run.

Using data from the Bureau of Labor Statistics on the number of people employed in these industries in Ohio, we estimate that **legalizing recreational cannabis will cost workers across the state about \$760 million in lost productivity** in the first year of legalization.¹⁷

Impaired Driving

Another consequence of more people using cannabis recreationally is more people driving their cars while they are impaired. This will lead to more car crashes that cause property damage, injury, and death.

One study found that following legalization of recreational cannabis in Colorado, there was a 16% increase in the number of charges of driving under the influence with marijuana involved.¹⁸ Using data from the Ohio State Highway Patrol on the number of charges of operation of a vehicle while intoxicated (“OVI”) that are drug related, we predict that an additional 1,700 OVIs will happen each year as a result of recreational cannabis legalization.¹⁹

16. Dominic K Albino, *The Marijuana Policy Impact on Labor Productivity*, technical report (Working Paper. University of Connecticut, 2017).

17. Labor Statistics, “Economy at a Glance.”

18. Tista S Ghosh et al., “Lessons learned after three years of legalized, recreational marijuana: The Colorado experience,” *Preventive Medicine* 104 (2017): 4–6.

19. Ohio State Highway Patrol, “OVI Dashboard,” 2023, <https://statepatrol.ohio.gov/dashboards-statistics/ostats-dashboards/ovi-dashboard/>.

To monetize the cost of these additional accidents, we use estimates from the National Safety Council.²⁰ In total, we predict that **Ohio will lose approximately \$130 million as a result of additional cannabis-related OVI's.**

Results

Below are point estimates of the most likely impacts of recreational marijuana legalization. Results may not sum perfectly due to rounding.

Benefits		Costs	
Consumer Surplus	\$99 million	Productivity	\$(760 million)
Tax Revenue	\$800 million	OVI's	\$(120 million)
Jobs	\$190 million		
Crime	\$38 million		
Total	\$1.2 billion		\$(880 million)
NPV	\$260 million		
BCR	1.29		

In total, we expect the social benefits of legalizing recreational cannabis to outweigh the costs by approximately \$260 million.

The largest economic benefit is the value generated by the tax revenue we expect the recreational cannabis market to generate. The programs outlined by the policy proposal that will get to use those tax dollars are extremely beneficial to society, and almost singlehandedly outweigh the total social costs of legalization.

Of the costs, the lost productivity we expect in the short term from cannabis legalization is the biggest concern. The industries where we expect there to be a noticeable effect are extremely productive, and generate a lot of value to our society. Although this may correct itself in the long run, we should expect losses to productivity soon after legalization of sale and purchase of recreational marijuana.

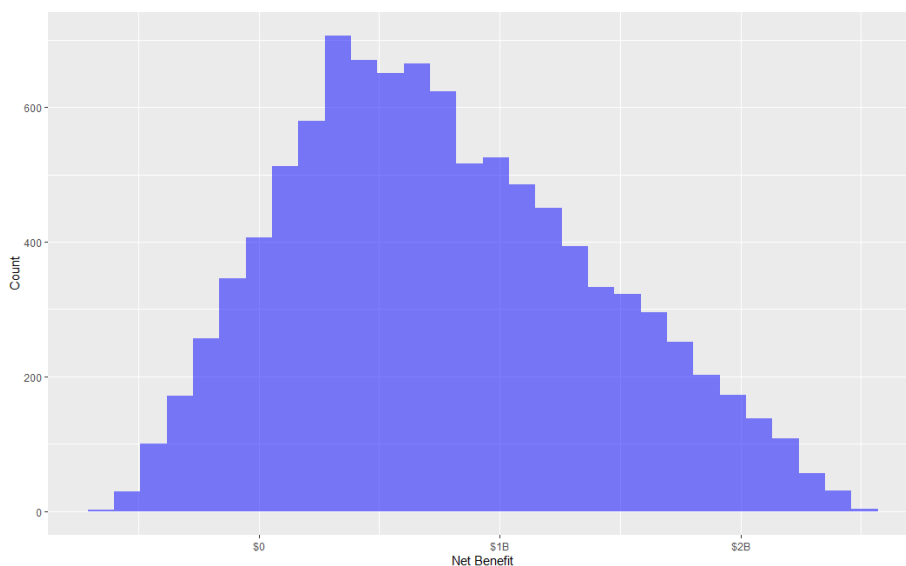


Figure 1: Monte Carlo Simulation Results

Sensitivity Analysis

For sensitivity analysis, we performed a Monte Carlo simulation with 10,000 replications to see how our models responded to the variability of our estimates. Below is the list of the variables we changed and a summary of what possible values they took:

- Consumer Tax Burden - We assumed that the tax burden was normally distributed with mean 0.44 and standard deviation 0.06. From this result, we can directly calculate the consumer surplus and the tax revenue.
- Value of Tax Revenue - We varied the value of the tax dollars collected triangularly between 0.64 and 16.95 with modal value 5.76. The upper and lower bounds were determined as the highest and lowest benefit cost ratio from WSIPP and the modal value is the average of those benefit cost ratios.
- Jobs - We varied the number of jobs created uniformly between 2,624 and 4,595. These represent the range of jobs created in other states during their first year of legalization weighted by state workforce size.

20. National Safety Council, “Motor Vehicle Injury Facts,” 2021, <https://injuryfacts.nsc.org/motor-vehicle/overview/introduction/>.

- Crime - We varied the percent decrease in cannabis-related arrests uniformly between 46% and 87%. These bounds are the reported decreases by age.
- Productivity - We varied the lost productivity between 0.97% and 1.3% following a triangular distribution with the modal value at 0.97%. This is because the researchers found that over time, the lost productivity could be as high as 1.3% as use increases.

Our sensitivity analysis suggests that legalizing recreational cannabis use has a 90% chance of returning positive net present value for society. The distribution is slightly right skewed, suggesting that extremely positive results are more likely than extremely negative results.

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